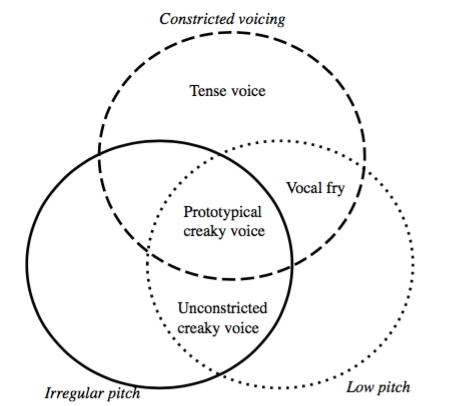
Garellek 2016:

* Voicing contrasts exist in a three-dimensional space rather than just a one-dimensional continue from breathy to modal to creaky (8):



* The acoustic and articulatory aspects of voice quality only matter if they are perceptible (10).
* Relevant acoustic measures from Kreiman 2014:
  + “Inharmonic”/noise component: HNR
  + Harmonic source (before filtering)/spectral slope: H1-H2, H2-H4, H4-H2 kHz, H2 kHz-H5 kHz
    - H4-H2 kHz: difference between fourth harmonic and the harmonic closest to 2000 Hz
  + Temporal components of the voice source: f0 tracking, amplitude tracking
  + Vocal tract transfer function (the filter that acts on the source): formant frequencies and bandwidths, spectral zeroes and bandwidths (11)
* Summary of different types of voice quality as compared with modal voice: (21):
  + Breathy voice:
    - Higher H1–H2, H2–H4, H4–H2 kHz, H2 kHz–H5 kHz Lower HNR
  + Prototypical creaky voice:
    - Lower H1–H2 H2–H4, H4–H2 kHz, H2 kHz–H5 kHz Lower HNR
    - Lower f0
  + Unconstricted creaky voice:
    - Higher H1–H2 H2–H4, H4–H2 kHz, H2 kHz–H5 kHz Lower HNR
    - Lower f0
  + Vocal fry:
    - Lower H1–H2 H2–H4, H4–H2 kHz, H2 kHz–H5 kHz No difference in HNR
    - Lower f0
  + Tense voice:
    - Lower H1–H2 H2–H4, H4–H2 kHz, H2 kHz–H5 kHz No difference in HNR
    - Higher f0

Keating, Garellek, and Kreiman 2015:

* Different types of creaky voice and their acoustic correlates:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Property | Low f0 | Irregular f0 | Glottal constriction | Damped pulses | Subharmonics |
| Main correlate | Low f0: (4)   * STRAIGHT is “robust in the face of F0 irregularity” * SHR pitch tracking is good for detecting multiply pulsed creak) * Lowering F0 may lower CPP | High noise:   * Low HNR (except for vocal fry, which has a relatively high HNR) | Glottal constriction:   * Low H1\*-H2\* | Low noise, narrow bandwidths:   * Low B1 values * High HNR | High SHR (only for multiply pulsed creak) |
| Type | | | | | |
| Prototypical | Yes | Yes | Yes |  |  |
| Vocal fry | Yes |  | Yes | Yes |  |
| Multiply pulsed |  | Yes | Yes |  | Yes |
| Aperiodic | No | Yes | Yes |  |  |
| Nonconstricted | Yes | Yes | No |  |  |
| Tense | No |  | Yes |  |  |